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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/800,940	03/15/2004	Hidenori Usuda	9319H-000721	1285

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EXAMINER	
GARCIA JR, RENE	

ART UNIT	PAPER NUMBER
2853	

DATE MAILED: 11/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/800,940	USUDA, HIDENORI	
	Examiner	Art Unit	
	Rene Garcia, Jr.	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

2. The indicated allowable subject matter of claim 7 [presently incorporated into claim 1] is withdrawn. Allen (US 4,746,935) includes a plurality of nozzle arrays and a single signal containing multiple pulses to fire ejection nozzles.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Allen (US 4,746,935).

Allen discloses the following claimed limitations:

*regarding claim 1, method of controlling the driving of a function liquid droplet ejection head/**printhead, 10/** having disposed therein a plurality of nozzle arrays/**orifices, 50,52,54 fig. 3A/** (fig. 5A & 5B; col. 5, lines 15-23 – nozzles that eject "4" binary ink volume constitute a nozzle array and nozzles that eject "1" & "2" binary ink volume constitute a second nozzle array set) with a different function liquid droplet ejection amount per unit nozzle (col. 2, lines 66-67)

*wherein, in one print cycle, driving of the plurality of nozzle arrays is controlled by using a single drive signal having a plurality of ejection pulses corresponding to the plurality of nozzle arrays (col. 3, lines 60-67; col. 2, lines 17-20; pulses are required to eject ink and the

nozzle are fired sequentially along the scan line therefore a signal contains pulses to fire necessary nozzle to form desired gray level)

*wherein the plurality of nozzle arrays include a first nozzle array (nozzle that eject "4" binary ink volume constitute a nozzle array) which ejects a first function liquid droplet ejection amount and a second nozzle array (nozzles that eject "1" & "2" binary ink volume constitute a second nozzle array set) which ejects a second function liquid droplet ejection amount which is smaller than the first function liquid droplet ejection amount, and wherein a number of nozzles in the second nozzle array is two times the number of nozzles in the first nozzle array (combination of nozzle ejecting "1" & "2" as shown in figures 5A & 5B are double that of nozzles ejecting "4"; claim limitations do not limit the nozzle array from contain more than one type of nozzle to constitute the array or that all nozzles are required to be used during ejection)

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Allen (US 4,746,35) in view of Kitahara et al. (US 6,328,395).

Allen discloses the claimed limitations except for the following:

*regarding claim 2, plurality of ejection pulses have waveforms which are different from each other in accordance with specifications of corresponding nozzle arrays

Kitahara et al. teaches the following:

*regarding claim 2, plurality of ejection pulses have waveforms which are different from each other in accordance with specifications of corresponding nozzle arrays (fig. 4; col. 6, line 66 – col. 7, line 27; claim limitations do not limit a specific nozzle array to have only one pulse associated with it, therefore can utilize a different pulse to vary amount of ink ejected)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize plurality of ejection pulses have waveforms which are different from each other in accordance with specifications of corresponding nozzle arrays as taught by Kitahara et al. into Allen for the purpose of ejecting droplet of varying sizes.

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Allen (US 4,746,935) in view of Minowa et al. (US 2001/0002134).

Allen discloses the claimed limitations except for the following:

*regarding claims 3 and 10, control means controls the plurality of nozzle arrays by using an identical ejection pulse in case of performing flushing which is function recovery processing by waste discharging of liquid droplets from all nozzles

Minowa et al. disclose the following:

*regarding claims 3 and 10, control means controls the plurality of nozzle arrays by using an identical ejection pulse in case of performing flushing which is function recovery processing by waste discharging of liquid droplets from all nozzles (paragraphs 0057 and 0055) for the purpose of preventing nozzle clogging and maintain printing performance

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize control means controls the plurality of nozzle arrays by using an identical ejection pulse in case of performing flushing which is function recovery processing by

waste discharging of liquid droplets from all nozzles as taught by Minowa et al. into Allen for the purpose of preventing nozzle clogging and maintain printing performance.

8. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Allen (US 4,746,935) in view of Junhua (US 200/0085962).

Allen discloses the claimed limitations except for the following:

*regarding claim 4, drive signal has a micro oscillation pulse which subjects a function liquid to form a meniscus of each nozzle to micro oscillation, and wherein only one waveform of the micro oscillation pulse is inputted in said one print cycle

*regarding claim 5, micro oscillation pulse is inputted before input of the plurality of ejection pulses in said one print cycle

Junhua disclose the following:

*regarding claim 4, drive signal has a micro oscillation pulse**/vibrating pulse/** which subjects a function liquid to form a meniscus of each nozzle to micro oscillation, and wherein only one waveform of the micro oscillation pulse is inputted in said one print cycle (paragraph 0028 & 0086; fig. 3) for the purposes agitating ink in the vicinity of nozzle orifice.

*regarding claim 5, micro oscillation pulse is inputted before input of the plurality of ejection pulses in said one print cycle (paragraph 0028 & 0086; fig. 3) for the purposes agitating ink in the vicinity of nozzle orifice.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize drive signal has a micro oscillation pulse which subjects a

function liquid to form a meniscus of each nozzle to micro oscillation, and wherein only one waveform of the micro oscillation pulse is inputted in said one print cycle; and micro oscillation pulse is inputted before input of the plurality of ejection pulses in said one print cycle as taught by Junhua into Allen for the purpose agitating ink in the vicinity of nozzle orifice.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Allen (US 4,746,935) in view of Takahashi (US 6,527,354).

Allen discloses the claimed limitations except for the following:

*regarding claim 6, drive signal has a damping pulse for damping residual oscillation of a pressure generating elementwhich generates pressure fluctuations in a cavity communicated with each nozzle, and wherein, in said one print cycle, the damping pulse is inputted after input of the plurality of ejection pulses and has a waveform corresponding to a waveform of the last inputted ejection pulse

Junhua disclose the following:

*regarding claim 6, drive signal has a damping pulse/**ink droplet reducing pulse, 2/** for damping residual oscillation of a pressure generating element/**actuator substrate, 601/** (col. 3, line 36) which generates pressure fluctuations in a cavity communicated with each nozzle, and wherein, in said one print cycle, the damping pulse is inputted after input of the plurality of ejection pulses and has a waveform corresponding to a waveform of the last inputted ejection pulse (col. 5, lines 25-32; fig. 1)

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize drive signal has a damping pulse for damping residual oscillation of a pressure generating element which generates pressure fluctuations in a cavity

communicated with each nozzle, and wherein, in said one print cycle, the damping pulse is inputted after input of the plurality of ejection pulses and has a waveform corresponding to a waveform of the last inputted ejection pulse as taught by Takahashi into Allen for the purpose preventing meniscus from ejecting and reducing size of droplet.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yamanaka et al. (US 2006/0050107), Tomizawa et al. (US 2004/0218007) & Murakami et al. (US 6,789,877) all teach utilize varying the physical size of the print nozzles to produce a different amount of ink to produce higher quality images (600dpi vs 1200dpi). However the structure does not also lead way to a method as disclosed in the present invention. Present invention provides a signal including pulse to control both sets of nozzles during the same print cycle, while in the cited art either the 600 dpi set or 1200 dpi set is used.

Communications with the USPTO

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rene Garcia, Jr. whose telephone number is (571) 272-5980. The examiner can normally be reached on M-F 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen D. Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rene Garcia Jr
11/06

STEPHEN MEIER
SUPERVISORY PATENT EXAMINER